



NOAA
FISHERIES



Topic 2.8.1: CCLME - Pinnipeds

AFSC's California Current Ecosystem Program:
Addressing West Coast Region Marine Mammal
Information Needs

AFSC, MML, California Current Ecosystem Program

Robert DeLong

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Terms of Reference Questions

2. Address priority needs of the West Coast Regional Office and other NOAA managers
4. Status of oceanographic, habitat, climate, and ecological data needed for ecosystem-related science needs
5. Cumulative and integrative analysis and modeling of ecosystem-level processes

West Coast Region Information Needs

- California sea lion adult male abundance and distribution in the NW in relation to predation of Endangered Salmonids and MMPA Section 120 authorization for lethal removal in the Columbia River
- Maintain long term data sets on California sea lion and northern fur seal pup production, growth and vital rates to detect trends of populations and provide inputs for population modeling to evaluate status relative to OSP
- Vital rates of the southern-most Eastern Stock of Steller sea lions & Post delisting assessments
- Maintain and increase Gray whale Photo ID catalog of Pacific Coast Feeding Group in support of Region's management of Makah Tribe Whaling
- Conduct or support stock assessments for Inland WA harbor seals and harbor porpoise, west coast Steller sea lions, California sea lions and California Stock of northern fur seals
- Support status review of Guadalupe fur seal
- Conduct and support California sea lion and Guadalupe fur seal Unusual Mortality Event investigations
- Support Region Stranding Response Program with predictions of likely annual stranding levels
- Advise on probable impacts of climate change on marine mammals in the California Current

AFSC/MML CCEP Pinniped Research Approaches

- Demography: Annual pup counts & Mark-recapture studies (Branded sea lions and tagged fur seals) provide estimation of survival and reproductive rates that are linked to ecosystem processes
- Health & Disease: Screening and necropsy identify pathogens and contaminants that travel through the food chain and cause pathology that impact reproduction and survival, and can be related to ocean and human health
- Foraging ecology/Food habits: Assess prey availability and diet, foraging energetics, foraging behavior and habitat use and relate to dynamic (e.g., upwelling, sea surface temperature) and static (e.g., bathymetry) ecosystem features
- Genetics: Determine stock structure, relatedness and resistance to disease
- Zooarcheology: Use past (up to 3,000 years) pinniped community structures and paleoecology to assess shifting baselines

Four Otariid pinniped species occupy the California Current

- California sea lions, Steller sea lions, Northern fur seals and Guadalupe fur seals all give birth annually and breed on islands in the California Current in early summer; females forage at sea and return to land to nurse pups
- Northern fur seals and Guadalupe fur seals *forage off the shelf in pelagic habitat* in southern, central, and northern California Current
- California sea lions and Steller sea lions *forage on the shelf and shelf break* in the southern, central and northern California Current
- **Natural history characteristics** make some species more tractable for study

Two Sea Lions Partition the California Current

California sea lions (U.S. Population 297,000)

- Rookeries primarily in California Channel Islands
 - Females are central place foragers from rookery for 11 months (2-4 d at sea trips & nurse pup 1.5 d) are residents of the central and southern CC
 - Males migrate from Channel Islands rookeries to northern CC and into the GOA LME where they are resident for 8 months each year
 - **Adult females, pups, juveniles and adult males are available on land year round**



Steller sea lions (WA/OR/CA Population 8,600)

- Rookery rocks in CA, OR & WA
 - Females are central place foragers from rookery(1 d at sea trips & nurse pup < 1 d); are resident at rookery for only 2 mo in northern CC
 - Females and pups move together northward up to 700 km for remainder of year
 - Males migrate after breeding to extreme northern CC and into the GOA LME
 - **Females and pups are only available on the rookery for 2 months of each year**



Two Fur Seals share the California Current

Northern fur seals (13,400)

Rookeries on San Miguel and SE Farallon Islands

- Females are central place foragers, feeding at sea for 4-6 days; returning to nurse pup for 2 days
- Resident in Central CC for 4 months, then females wean the pup and enter pelagic phase for 8 months in the central and northern CC and oceanic waters
- Females and pups available for 4 months on rookery, but most pups do not return until age 4



Guadalupe fur seals (~ 12,000)

Rookeries primarily at Isla de Guadalupe, Mexico (small colonies at San Benito Islands & San Miguel Island)

- Females are central place foragers feeding at sea for ~ 14 days; returning to nurse pups up to 4 days
- Resident in the southern CC for up to 9 months then females wean the pup and enter pelagic phase for 3 months in southern, central and northern CC in offshore waters
- Females and pups available on land for up to 9 months of each year in Mexico



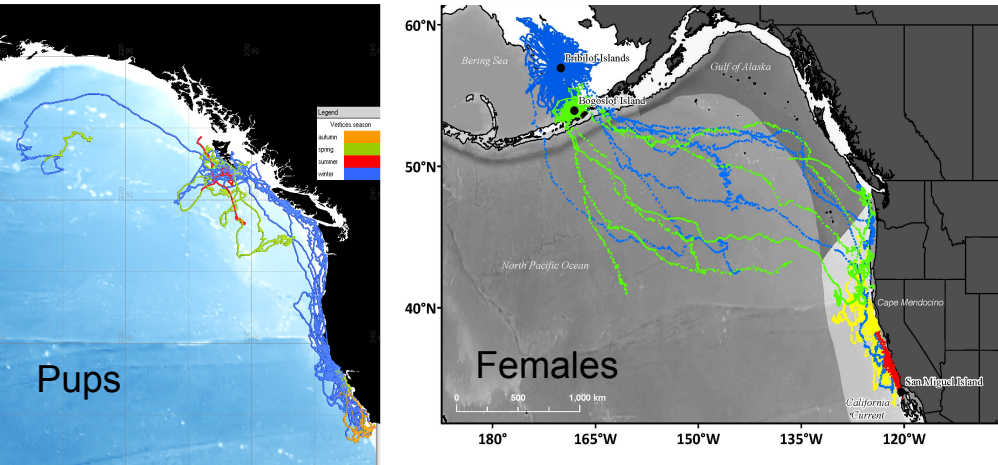
Impacts of Climate Change on Marine Mammals in California Current

- Provide baseline demography time series to evaluate climate induced changes
- Integrate ecosystem processes into modeling of vital rates, distribution, foraging behavior in support of management options and objectives (a hint from the new occurrence of juvenile male California sea lions in the Columbia River in winter and spring 2015 and 2016)
- Evaluate sea level rise on change in available terrestrial pinniped rookery habitat

Fur seals and sea lions use multiple LMEs and provide opportunity for collaboration within MML

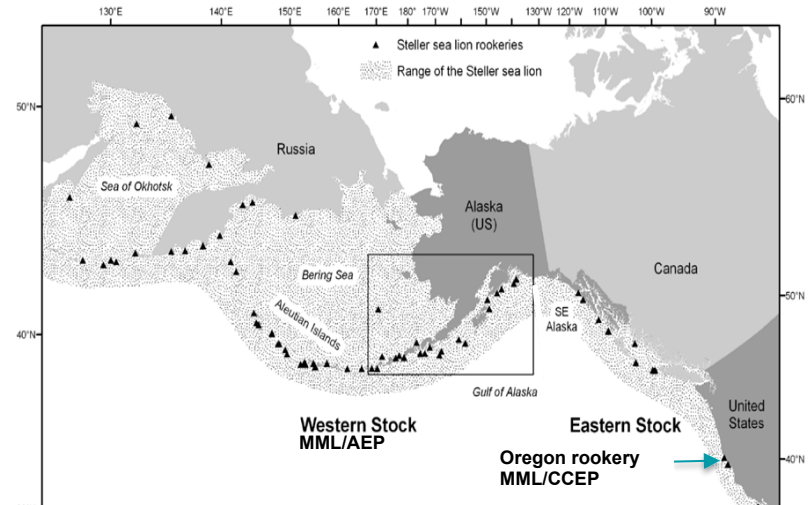
Northern fur seals

- Eastern Pacific Stock declining & California Stock increasing
- Winter distribution of Eastern Pacific Stock females and juveniles is in the California Current
- Pups from California stock spend first winter in northern CC and GOA
- Collaborative studies with MML/AEP investigate distribution and foraging behavior to examine causes of divergent population trends



Steller sea lions

- Eastern Stock in GOA and CC LME's & delisted in 2013
- Vital rates assessments based on resightings of animals branded as pups
 - MML/AEP(Western Stock)
 - MML/CCEP and Oregon Department of Fish and Wildlife (OR/CA Eastern Stock)



Interagency Collaborations to Facilitate Marine Mammal Protection Act Compliance

Navy

- Harbor seals in Hood Canal, WA
- California sea lion adult male use of Navy Facilities in Puget Sound, WA a collaboration with Washington Department of Fish and Wildlife
- Population assessment of California sea lions at San Nicolas Island



Bureau of Ocean Energy Management

- CSL use of Oil and Gas Platforms in the Southern California Outer Continental Shelf
- Time-lapse cameras to estimate numbers using 5 different platforms



Collaborations

Government

- NMFS
 - Southwest Fisheries Science Center
 - Northwest Fisheries Science Center
 - Marine Mammal Health and Stranding Program
 - Science and Technology
 - West Coast Region
 - Alaska Region
 - AFSC/MML Alaska Ecosystem Program
- Channel Islands National Park
- U.S. Navy
- Bureau of Ocean Energy Management
- Washington Department of Fish and Wildlife
- Oregon Department of Fish and Wildlife
- Smithsonian Institution
- Makah Tribal Fisheries
- U.S. Fish and Wildlife Oregon Coastal Refuge
- U.S. Fish and Wildlife Olympic Coastal Refuge

Universities

- University of California Los Angeles
- University of California Davis
- Colorado State University
- University of Kentucky
- University of Florida
- University of California Santa Cruz
- University of Oregon
- San Diego State University
- University of California San Diego
- University of New Mexico
- Humboldt State University

Private/non-profit

- The Marine Mammal Center
- Sea World
- Cascadia Research Collective
- Seattle Aquarium
- West Coast Stranding Centers
- National Marine Mammal Foundation

Program Scientific Accomplishments in FY 2015

- Documented establishment of new Steller sea lion rookery on Washington outer coast that produces ~100 pups (No historic record of breeding there)
- Assessed shift in environmental conditions and prey availability as cause of California sea lion low pup growth, high mortality and Unusual Mortality Event
- Completed OSP assessment for U.S. California sea lion population using pup counts and survival rates
- Updated Status Assessment Report for Inland Washington Harbor porpoise based on 2015 surveys

Communications and Outreach

- PARR
- Seattle Aquarium – Communicate northern fur seal and harbor seal NOAA science to the public
- Secondary Schools
 - Killer Whale curriculum
 - Northern fur seal curriculum
 - MMPA curriculum
- BBC Blue Planet Series: California sea lion Sentinel Species (CINP, CIMS, MBMS, UCSC) evaluate impacts of changes in climate, ecosystem in the California Current (Filming at San Miguel Island, June 2016)
- Channel Islands National Park: Interpretation of pinniped biology for Visitors Center
- Stranding Centers outreach on California sea lion, northern fur seal and Guadalupe fur seal biology

AFSC/ MML California Current Ecosystem Program

Strengths

- 40+ year data series
- Devoted field biologists (7) that spend > 400 person-days afield each year
- Field locations facilitate cost effective investigations
- Internal and external collaborations

Challenges

- Aging personnel & retirements will decrease “boots on the ground”
- Maintaining long term pinniped data bases critical to detecting impacts of climate change
- Understanding how environmental change affects seasonal and local pinniped prey availability
- Diet information based on scat is a snapshot in time. Is it an adequate representation of consumption?

Solutions

- Increase field personnel with contractors
- Increase collaborations to obtain local prey species availability
- Validate diet assessment with methods that integrate food habits over time (e.g., fatty acid analysis of blubber, stable isotope analysis)